MODIS QUARTERLY REPORT
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RSMAS/MPO

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Due to the interlocking nature of a number of projects, this and subsequent reports will contain coding to reflect the funding source. MODIS funded activities are designated with an M, SeaWiFS with an S, and Pathfinder with a P. There are several major sections within this report; Database, client/server, matchup database, and DSP support.

A. NEAR TERM OBJECTIVES

A.1 MODIS Objectives (M)

A.1.1. Continue to develop and expand the processing environment

a. increase computational efficiency through concurrent operations

b. determine and apply more efficient methods of data availability for processes

A.1.2. Begin extensive testing using global color and AVHRR GAC data with database processing to test the following:

a. algorithm capability

b. machine and operating system stability

c. functionality required for the processing and analysis environment

A.2 SeaWiFS Objectives (S)

A.2.1. Continue testing of processing methodology.

A.2.2. Continue to develop relationship between database and in- situ environment.

A.3 Pathfinder Objectives (P)

A.3.1. Expand matchup database as applicable.

A.3.2. Continue testing of methodology.

A.3.3 Train and integrate new personnel into Matchup Database processing scheme.

B. OVERVIEW OF CURRENT PROGRESS

B.1 Automatic Processing Database (P)

B.1.1 Processing -Pathfinder

B.1.1,1 July 97 Pathfinder Processing

A special run of the 4km processing stream was made for three weeks in early 1997, using the 1995 coefficients, since current year coefficients are not yet available.

For the regular processing, weeks 9501-9552 were calculated.

B.1.1.2 Aug. 97 Pathfinder Processing

Processing was slow due to personnel on vacation, visitor training and major equipment problems. However, 93-94 were processed.

B.1.1.3 Sept. 97 Pathfinder Processing

Equipment and development problems still prevented smooth processing. The addition of multiple processing streams (see the Development section) required repeated testing of a few day's worth of orbits, so the normal Pathfinder processing was only started intermittently, to insure that it still runs normally.

Add a real time AVHRR processing capability. Use to explore and refine requirements for MODIS processing. The real-time processing stream is operating, but development is still needed before it is truly operational.

B.1.2 APServer Development

B.1.2.1 July 97 Pathfinder Development

The 4km global processing was finalized. The processing for this can only be done on the two DEC machines with the most memory, and the processing procedures were changed to reflect this special case.

A number of minor problems were discovered and corrected in the PATHTIME program (which combines two or more binned data files).

Processing procedures were adjusted to have the SGI machine, andrew, perform the daily and weekly jobs, formerly done by the DEC machine apricot. In addition, the spooling job (entry point for the input data files) where changed to run on apricot.

Since the orbital processing has not been run on the SGI for a longtime, several orbits were processed concurrently on both SGI and DEC machines, to make sure they were producing the same results.

B.1.2.2 Aug. 97 Pathfinder Development

For future reference, a coastal mask is being developed, which will be used to denote areas where 4km processing will be desired. This mask will cover approximately 800km offshore of most coastlines, and is intended for use in studies of both eastern and boundary currents. MODIS equivalents will use 1 and 4km files.

B.1.2.3 Sept. 97 Pathfinder Development

The entire Pathfinder/AutoSys processing system was modified to permit the definition of two or more separate processing streams that can run independently, but concurrently. Job names are now prefaced by a version type(a two-character code giving the type of processing) and each processing stream defines its own run parameters (such at resolution, type of output file).This required numerous changes to nearly all command files.

A "real-time" processing stream was developed, which runs on data being currently taken. This stream is not completed, and requires further development.

A decision was made to make changes to the mask bits in the Pathfinder processing. This change is also not complete, but will require more calculation, which will be termed "pfv42".

B.2 Processing Systems Status (M)

B.2.1 MODIS Version 2 (at-launch algorithms)

Current versions of PGE09 (modcol) and PGE10 (modsst) were delivered to SDST on Aug 1th. SDST updated the code with V2 L1 I/O routines and metadata functions. These updates were merged into the current baseline.

MODIS make procedures were updated to conform to the latest naming conventions for directories and build procedure environment variables requested by the DAAC.

B.2.2 SeaWiFS

We have begun preparations for SeaWiFS data processing. The automated processing programs and procedures were enhanced to improve resource allocation and monitoring among multiple job streams (avhrr, seawifs, etc.). C.

Systems/COTS

Autosys The permanent licenses for IRIX were installed on andrew (Challenge, IRIX 6.2) and jaboticaba (Origin, IRIX 6.4). The latest version AutoSys for IRIX is V3.2. Autosys V3.2 is not compatible with IRIX 6.4 and neither is AutoSys V3.4 to be released in October, so support for AutoSys on IRIX 6.4 appears to be at least three months away (the next scheduled maintenance release of V3.4).

B.2.3 Sybase

A disk crash destroyed the Sybase database on andrew. We were successful in restoring AutoSys client functions, but until a new disk is located we are without the andrew AutoSys console.

B.2.4 ATM Local area networking

During this quarter we continued the integration of the production ATM network and the new campus ATM backbone with the primary goal to increasing bandwidth through the gateway (IP firewall). The campus ATM switch was connected via multimode fiber (OC3) to the central ATM switch in the remote sensing lab and the firewall machine upgraded with an ATM OC3 adapter. In this configuration, any ATM attached host or network device can be configured to be a part of the campus ELAN (LANE V1.0) or join the Classical IP (RFC1577) subnet used for data processing. This enables the firewall host equipped with dual ATM adapters to have an OC3 connection in both directions. However, the peak data rate we have seen using IP over LANE is 40Mbs vs 80Mbs over Classical IP.

B.3 Matchup Database (P)

B.3.1 3rd Quarter Matchup Database

Matchup database:

Perl scripts for v19 of the archive matchup database were finalized and documented. This new version of the matchup database includes all pixel information within the satellite extraction box and additional parameters from ancillary databases. The v19 database contains all matchups, both cloud contaminated and clear extractions. Records now contain a field which identifies those pixels passing the cloud detection tests which are based on classification tree techniques developed earlier this year by Dr. G. Podesta . Ancillary data from various sources were obtained and processed for inclusion in V19 matchup records. These additional parameters should be a valuable tools during algorithm validation and development. These sources include:

1. Daily SSMI integrated water vapor data using the recently updated Pathfinder version developed by Wentz.
2. Reynolds weekly OI sea surface temperature
3.NGDC Etopo5 water column depth
4. Weekly maximum ice masks created from SSMI daily ice data obtained from the NSIDC SSMI.
5. TOVS water vapor profiles and other parameters. The TOVS dataset received from the DAAC is 293GB, we are presently developing techniques to reformat and processing the data for inclusion in the matchup database.

Real-time Matchup Database:
The ability to create monthly “real time” matchups should be operational within the next quarter.

During this past quarter work focused on understanding the limitations of the real-time insitu SST data obtained by the Navy over the GTS, and development of QC procedures to flag and eliminate problem records from the database. Quality control scripts were written for both drifting and moored buoys. The drifting QC includes checks for reasonable SST values and speed and position checks. Moored buoy QC includes checks for reasonable SST values and that position remains within a 0.1 degree radius of the center of the mooring watch circle. Position re-sets due to mooring maintenance are also identified.

Both drifter and moored insitu SST values are monitored for sensor failure by comparison to a reference value. The buoy SST must be within +-10 C of the Reynolds weekly OI mean SST reference (1 degree res) . This test, however, still allows some "bad" records to pass QC due to the low time and space resolution of the Reynolds data, and the 10 C window needed to retain values in frontal areas. A second, more stringent, conformity check is presently being tested for possible use. This test uses an 18km resolution, two day, satellite SST OA analysis as the reference. Insitu values within +-2 C of any reference OA located with in a 100 km radius of the insitu position are retained. Additional scripting procedures to automate the real-time extraction process were also developed. These include daily updating of orbital models, creation of extraction lists, and determination of satellite clock re-sets and drift on a real time basis.

Preliminary comparison of AVHRR SST algorithm coefficients estimated from the larger 1996 archive database with that of the 1996 real-time data stream are currently in progress.

B.4 DSP Support (M)
September 1997.

Testing:

Modifications/Additions to DSP:

B.4.1 Testing:

None Described.

B.4.2 Modifications/Additions to DSP:

None Described.

B.4.3 PROBLEMS FIXED:

Problems fixed:

SSBIN-HDF: Fix type for eng_q_use. Fix use of CFLAGS. Change FOPTS.
Fix dateline stuff again. Take out debugs.
VHRR: Work around f77 optimizer bug (temporary I hope).
MODCOL: Add/update trial pcf files. Rename O2_ATOT_MODx to O2_ATOT_MODnnn.
Add include file now needed for TK5.2v1 Add new variable to specify aerosol models to use. Initial version of wang3.f and parsearray.rat. Switch from wang2.f to wang3.f (and switch associated routines). update prologs Updated versions of pcf tailored to reflect changes in wang3.f and colorsub8.c. Switch to new flag arrangements in output files. Increase optimizer table limits. New output file flag definitions and layouts. Split Rayleigh table reading from Rayleigh coefficient calculation. Only check for common flags as keywords. Correct list of default keywords in pcf for mskflg. Correct defaults for mskflg. Convert to new output file flag groupings. Add support for new flags in output files. Remove arrays for unused ancillary input files. Apply optimizations: externalize 'ilo' from INTERV as it gets called with two separate angles. Remove INTERV call from SPL1D2 creating new version SPL1D2LCL and pass in index value generated by INTERV. Create ANGLE_INDICES to consolidate code in FUNCT_EPS and TAUA_INVERT; Save results and test for same input parameters to optimize against expected repeated calls. Wrap cos() evaluations with input angle checks to optimize against expected repeat calls in FUNCT_A_B_C_D_FOURIER. Add two arguments to newatm to speed up processing.
Add two arguments to newatm (current pixel and scan line). Add code to reduce calls to funct_a_b_c_d_fourier for speed. Add more debugging hooks. Correct setting of lastscan/lastpixel. Add 2-d subsampling for funct_a_b_c_d_fourier coefficients for performance. More debug printouts. Use land/sea mask from MOD35 (geoloc). Use new v2 level 1 read routines, and v2 set metadata routine. Correct Rayleigh reflectance computation. Remove oxygen correction (not used for MODIS .. already in tables). Add file access logging after each file open. Add comment terminator to silence C compiler warning. Remove land and water filenames from mice table -- now using 'PGS' versions. Compute funct_eps on same sparse grid as funct_a_b_c_d_fourier. Add explicit logical for epsilon validity (was implicitly valid).
LIB/MOCEAN/MOCEANCREATE.C: Add DATA_TYPE_CHAR option. SDST change: must
SWdetach and re-SWattach.
MODSST: Use new flags. Use real instead of integer constant to initialize a real variable. Change include files to work with latest Toolkit. Add v2 metadata routines; change compile option limits. Add new flags and quality bands. Check both common and general flags. Use real instead of integer constants. Echo new command line properly. Change everything the user sees (input parameter names, messages) to use modis channel numbers. Make both sst and sst4 like pathnlc (used noaa-9 tree test for now). Add new quality and flag bands. Comment out all previously ifdef'd out code. Start to add v2 metadata routines. Change bias to be in Deg C (instead of Deg K). Add Land bit in common flags. Fix use of v2 metadata routines; use v2 L1 read routines; Fix metadata for new flag and quality bands. Read in modis channels 6 and 29; use new V2 level 1 read routines and metadata routines; rename all internal variables to reference actual modis channel numbers; use the land/sea mask from MOD03 (geoloc). Declare char parameter

to be proper size array (not 1). Declare input parameter character string to be proper length (not 1); trim spaces off the end of input string. New routine setmeta to initialize metadata fields; new routine getsstpar to read run time parameters from modsst_params1.dat. New routine setmeta to initialize metadata fields; new routine getsstpar to read run time parameters from modsst_params1.dat.

MCOLSHR8: Disable old Rayleigh calculation (and reading of associated tables). update prologs Remove unused ancillary data files. Remove old Rayleigh calculation (now in wang3.f). Remove source files no longer used by library/modcol. Remove include file dependencies from makefile.

DSP: Increase the size of the hash tables.

ANLY8D: Include optimizations from MODIS version including externalizing ILO from INTERV because SPL1D2 gets called twice with different angles. So keep a separate copy of ILO for each unique call to SPL1D2 (and hence INTERV). Move constant code outside do loops in load_ss11 as the results are constant with respect to the do loops. Create two versions of agl (agl1 and agl2) to hold the results of the calculations. Only the f(x) result is used from SPL1D2 so don't compute f'(x) and f''(x).

PATHNLC: For tree test: mask1 bit 1 is brightness, bit 7 is satz; for noaa-9 check for jan 94, instead of Sep 94; add tree test for noaa-11; comment out some ifdef'd code.

PATHBIN: Increase buffer sizes to handle 4km bins. Change flags/quality determination for tree test. Comment out old code (which was ifdef'd). Change some debugs. Remove ch4m5 band from allb=2.

B.5.2 MODIS (M)

B.5.2.1 Jim Brown has integrated Howard Gordon's latest atmospheric correction algorithms into MODIS level 1->level 2 application. He has also been optimizing these codes for execution speed while maintaining correctness of result; the optimized code is more than 15x faster than original code.

B.5.2.2 Bob Evans and Pete Evans worked with Dennis Clark of NOAA/NESDIS to improve the networking at Hawaii MOBY site. Optical fiber, network hardware and IR LAN hardware were installed.

B.5.2.3 MODIS Documentation:

All prologs for subroutines in the MODIS oceans software were updated to reflect version 2, in compliance with NASA software development standards and guidelines. The file format description document was also updated with new file descriptions and obsolete description deleted where required. Volume and loads documents were updated to reflect the addition of new flags in V2.

In conjunction with Dr. Mark Abbott and Jasime Bartlett of the University of Oregon Corvalis, an outline was developed for an overview document of the MODIS software. This overview will describe each of the MODIS oceans software modules and their associated subroutines and algorithms. The document is being written to aide the Japanese with development of the GLI instrument.

B.5.2.4 Mod_sst coefficients:
Preliminary coefficients for the MODIS V2 SST algorithm were estimated using a simulated SST matchup database. The simulated matchups were developed by Drs. P. Minnett and R. Sikorski using radiosonde data as input to a modified Rutherford-Appleton Laboratory radiative transfer model which estimated both sea-surface temperature and satellite brightness temperatures at MODIS wavebands.

B.6 Team Interactions

C. FUTURE ACTIVITIES

C.1 Database Future Work

C.2 Client/Server Future Work

C.3 Pathfinder (P)

C.3.2 Continue algorithm tests and Pathfinder-Reynolds comparisons.

C.4 MODIS (M)
C.4.1. Prepare for delivery of V2 code for each of the MOCEAN PGE's
C.4.2. Use SeaWiFS and AVHRR data to simulate MODIS production and product flows. Establish PGE run times using both simulated MODIS and actual SeaWiFS/AVHRR data provide average run times for real cloud and land distributions.
C.4.3. Finalize ESDT's, metadata and other required fields for product files.

C.5 SeaWiFS (S)
C.5.1 Jim Brown has supported Hooker's AMT cruises (data acquisition software development and etc. using Labview).

C.5.2 Preliminary efforts to process actual SeaWiFS data have begun. Production to be used to test MODIS flows and test MODIS and SeaWiFS algorithms.

C.5.3 Continue timing tests with MODIS and SeaWiFS algorithms.

D. PROBLEMS

D.1 Database Problems

Need updates on metadata items required for product files..

D.2 Client/Server Problems

None listed separately

D.3 Matchup Database Problems

None listed separately

D.4 DSP Related Problems

None listed separately